



[10191/1295] *HP 2877*  
**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**BOARD OF PATENT APPEALS AND INTERFERENCES**

*410/Recal  
Brief  
195/lay*

Application of:

HAHN et al. : Confirmation No.: 1777  
For: ELLIPSOMETER : Examiner : G. Stock, Jr.  
MEASUREMENT APPARATUS : Art Unit : 2877  
Filed: May 22, 2000 :  
Serial No.: 09/485,325 :  
Customer No.: 26646 :

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

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Date 12/01/03

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Atty Reg. # 41,172

*(D) L. Mayer*  
DERIVIS MAGISTER  
KENYON & KENYON

**APPEAL BRIEF TRANSMITTAL**

SIR:

Transmitted herewith for filing in the above-identified patent application, please find an Appeal Brief pursuant to 37 C.F.R. § 1.192(a), in triplicate.

Please charge the Appeal Brief fee of \$330.00, and any other fees that may be required in connection with this communication to the deposit account of **Kenyon & Kenyon**, deposit account number **11-0600**.

Appellants hereby request a two-month extension of time for submitting the Appeal Brief. The extended period for submitting the Appeal Brief expires on December 1, 2003 (November 29<sup>th</sup> being a Saturday). Please charge the \$420.00 extension fee and any other fee that may be required to Deposit Account No. 11-0600. A duplicate of this Transmittal is enclosed.

Respectfully submitted,

By: *L. Mayer (Reg. No. 41,172)*

By: *Richard L. Mayer*  
Richard L. Mayer  
Reg. No. 22,490

Dated: 12/1/03

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[10191/1295]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
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Alexandria, VA 22313-1450

**APPEAL BRIEF PURSUANT TO 37 C.F.R. § 1.192(a)**

SIR:

On July 29, 2003, Appellants filed a Notice of Appeal from the final rejection of claims 9-16 contained in the Final Office Action issued by the U.S. Patent and Trademark Office on January 29, 2003, in the above-identified patent application.

In accordance with 37 C.F.R. § 1.192(a), this brief is submitted in triplicate in support of the appeal of the final rejection of claims 9-16. For the reasons set forth below, the final rejection of claims 9-16 should be reversed.

**1. REAL PARTY IN INTEREST**

The real party in interest in the present appeal is Robert Bosch GmbH, Stuttgart, Federal Republic of Germany. Robert Bosch GmbH is the assignee of the entire right, title, and interest in the above-identified application.

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## **2. RELATED APPEALS AND INTERFERENCES**

There are no interferences or other appeals related to the above-identified application.

## **3. STATUS OF CLAIMS**

Claims 9, 10, and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 5,764,365 to Finarov (“Finarov”).

Claim 11 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Finarov in view of United States Patent No. 4,999,014 to Gold et al. (“Gold”).

Claims 12 and 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Finarov in view of United States Patent No. 5,838,432 to Tokuhashi et al. (“Tokuhashi”).

## **4. STATUS OF AMENDMENTS**

In response to the Final Office Action that issued on January 29, 2003, Appellants filed a Response After Final. No amendments to the claims have been made since the Final Office Action.

## **5. SUMMARY OF THE INVENTION**

It is the object of the invention to make available an ellipsometer measurement apparatus of the kind recited initially that, while easy to adjust and handle, supplies accurate measurement results even at difficult-to-access locations and with differing curvature profiles. (Page 2, lines 8-12).

This object is achieved with the features of Claim 1. According to this, an angle measurement device is provided with which the angle of the reflected beam relative to a tangential plane of the substrate at the incidence point can be sensed, and the film thickness can be determined by way of the evaluation device as a function of the angle that is sensed. Because the angle of the reflected beam is sensed and is additionally evaluated in order to calculate the film thickness, the measurement apparatus can easily be placed on the film and the measurement can readily be performed. The

resulting angle is automatically and accurately taken into account, and is incorporated into the calculation of the film thickness using algorithms known per se. (Page 2, lines 14-26).

Measurement of the angle can also be accomplished in simple fashion by the fact that the angle measurement device has a photodetector unit that is position-sensitive in the X and/or Y direction, as well as an evaluation stage with which the angle of reflection can be calculated from the position data and from distance data. Experiments have shown that even a one-dimensional angle determination yields good measurement results for the film thickness. (Page 2, lines 28-35).

The simple configuration is promoted by the fact that the intensity changes and the position of the reflected beam are sensed with the same photodetector of the photodetector device. (Page 2, lines 37-40).

A further possibility for easy determination of the angle consists in the fact that the photodetector device has two position-sensitive photodetectors arranged at different distances from the incidence point in the beam path of the reflected beam, and that the angle is calculated on the basis of the differing positions of the reflected beam on the two photodetectors. Here again, one of the photodetectors can be utilized simultaneously to measure the intensity changes of the reflected beam. (Page 3, lines 1-9).

When the angle is determined using two photodetectors, the configuration can be, for example, such that a beam splitter is arranged in the beam path of the reflected beam in front of the two photodetectors, and that each photodetector receives a partial beam of the reflected beam. Alternatively, the two photodetectors can also be arranged one behind another, a portion of the reflected beam passing through the front photodetector. (Page 3, lines 11-18).

If only one photodetector is used, provision is advantageously made for a converging lens to be arranged in front of the photodetector device. (Page 3, lines 20-22).

Simple handling is promoted by the fact that the transmitting optical system and the receiving optical system are integrated into a common carrier, and that the carrier has a three-point support for placement on the film. With this configuration, unequivocal placement on the film is also always guaranteed. The three-point support can comprise, for example, a ball support which on the one hand guarantees single-point support at the three support points and on the other hand prevents damage to the film. (Page 3, lines 24-32).

In order to obtain reliable measurement results, it has proven advantageous to use a configuration in which the transmitting optical system has a polarizer and a  $\lambda/4$  plate in the beam path of the incoming beam, and the polarizer or the analyzer is arranged in rotationally drivable fashion about an axis normal to its surface. (Page 3, lines 34-39).

## 6. ISSUES

Under 35 U.S.C. § 103(a), are claims 9, 10, and 14-16 unpatentable over Finarov?

Under 35 U.S.C. § 103(a), is claim 11 unpatentable over Finarov in view of Gold?

Under 35 U.S.C. § 103(a), are claims 12 and 13 unpatentable over Finarov in view of Tokuhashi?

## 7. GROUPING OF CLAIMS

Claims 9, 10, and 14-16 do not stand or fall together.

Claims 12 and 13 stand or fall together.

## 8. ARGUMENT

Claims 9, 10, and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 5,764,365 to Finarov ("Finarov").

In the Amendment filed on November 1, 2002, Appellants amended claim 9 to recite that the angle measurement device senses an angle of the reflected beam relative to a tangential plane that does not intersect the substrate in an area of

the incidence point. In commenting on this amendment in the present Office Action, the Examiner concedes that this limitation is not found in Figure 5C, but he now relies on Figure 2 to show it. Appellants respectfully submit that this reliance on Figure 2 is misplaced. According to Finarov, Figure 5C, on which the Examiner originally relied, illustrates a system that forms part of the monitor of Figure 4. Column 4, lines 52-54. The monitor of Figure 4, in turn, is described as “utilizing the principles illustrated in Figure 2.” Column 4, lines 44-45. The use by the monitor in Figure 4 of the principles illustrated in Figure 2 undermines the Examiner’s reliance on Figure 2. In particular, if the monitor of Figure 4 (the angle measurement unit of which is illustrated in more detail in Figure 5C) operates according to the principles set forth in Figure 2, and if this monitor does not, as the Examiner concedes, include the angle measurement device recited in the claims, then Figure 2 cannot be reasonably seen as supplying the particular angle sensing feature recited in the claims.

Moreover, in applying Figure 2 of Finarov to the claims, the Examiner ignores that what the claim recites is the sensing of an angle, not the derivation of it. Commenting on Figure 2, the Examiner states that “Finarov teaches in Fig.2, the incident angle is derived from an angle made with the mirror [72] and the beam that is parallel to the scanning axis.” Office Action at page 3. (Emphasis added, insertion added). However true that statement may be, it is not relevant to the claims because the claims recite an “angle measurement device sensing an angle of the reflected beam relative to a tangential plane...” (Emphasis added). In Finarov, there is no sensing of angle  $\beta$  and the derivation of incident angle  $\theta$  does not meet the angle sensing recited in claim 9. Moreover, by focusing on the angle in Figure 2 formed by the beam incident on mirror 72 and the beam reflected from mirror 72 (angle  $\beta$ ), the Examiner has relied on the wrong angle. In particular, the “reflected beam” in claim 9 forming, with the tangential plane, the angle sensed by the angle measurement device is the beam reflected from the substrate, not from a mirror positioned before the beam reaches the substrate. The reflected beam relied on by the Examiner in his discussion of Figure 2 is thus not relevant to the recited reflected beam in claim 9 because the reflected beam relied on by the Examiner has not yet impinged on the substrate and therefore cannot be considered a beam reflected from the substrate, as is the case in the claim. For at least these reasons, withdrawal of the rejection of claim 9 is

respectfully requested.

Claim 11 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Finarov in view of United States Patent No. 4,999,014 to Gold et al. (“Gold”).

Notwithstanding the above, Appellants submit the following additional reason in support of the patentability of claim 11. Although Gold teaches the use of a detector 50 to measure the intensity of a probe beam, it does not teach that this detector measures a change in its intensity. As seen in the equations in column 7, and in lines 3-6, the intensity of the beam (as opposed to a change in intensity) is used to determine the reflectivity of the sample, which in turn is used to derive the layer thickness.

As for claims 10 and 14-16, Appellants submit that these claims are patentable for at least the same reasons given in support of the patentability of claim 9.

Notwithstanding the above, Appellants submit the following additional arguments in support of the patentability of claim 15. Claim 15 recites that the “transmitting optical system” and the “receiving optical system” are “integrated into a common carrier.” In his rejection of claim 9, the Examiner asserts that Fig. 5c, in particular elements 156, 152, and 102, shows the receiving optical system. Moreover, the Examiner relies on Fig. 4 to show the integration of this system with elements 100, 150, and 154, which the Examiner likens to the “transmitting optical system” of claim 9. Yet what is telling from this rejection is that the Examiner never identifies by reference character which element of Finarov is believed by the Examiner to meet the recited carrier. Indeed, such an integration as recited in claim 15 cannot be found in Finarov because elements 100, 102, 104 in Figure 4 are illustrated as being separate from, not integrated with, each other.

Another point of distinction with respect to claim 15 is that the Examiner never identifies in Finarov a teaching of a carrier with a three point support.

Since Gold does not overcome the deficiencies noted above with respect to Finarov, withdrawal of this rejection is respectfully requested.

Claims 12 and 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Finarov in view of United States Patent No. 5,838,432 to Tokuhashi et al. (“Tokuhashi”).

Since Tokuhashi does not overcome the deficiencies noted above with respect to Finarov, Appellants respectfully request withdrawal of this rejection.

Appellants assert that the present invention is new, non-obvious, and useful. Consideration and allowance of the claims are requested.

A copy of the claims on appeal is attached hereto in the Appendix.

**9. CONCLUSION**

Reversal of the Examiner's rejection of the above-discussed claims is therefore respectfully requested.

Respectfully submitted,

Dated: 12/1/03

By: Richard L. Mayer  
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**APPENDIX**

9. An ellipsometer measurement apparatus for determining a thickness of a film applied on a substrate, comprising:
  - a light source emitting a beam;
  - a transmitting optical system conveying the beam to an incidence point on the substrate, the substrate reflecting the beam from the incidence point;
  - a photodetector device;
  - a receiving optical system conveying the reflected beam to the photodetector device, the receiving optical system including an analyzer, a polarization direction of the beam and of the analyzer being modified in time relative to one another;
  - an evaluation device evaluating intensity changes in the reflected beam and determining the film thickness as a function of the intensity changes; and
  - an angle measurement device sensing an angle of the reflected beam relative to a tangential plane that does not intersect the substrate in an area of the incidence point, the evaluation device determining the film thickness as a function of the sensed angle.
10. The measurement apparatus according to claim 9, wherein the angle measurement device includes a photodetector unit that is position-sensitive in at least one of an X and Y direction, an angle of reflection being calculated from position data and distance data with an evaluation stage.
11. An ellipsometer measurement apparatus for determining a thickness of a film applied on a substrate, comprising:
  - a light source emitting a beam;
  - a transmitting optical system conveying the beam to an incidence point on the substrate, the substrate reflecting the beam from the incidence point;
  - a photodetector device;

a receiving optical system conveying the reflected beam to the photodetector device, the receiving optical system including an analyzer, a polarization direction of the beam and of the analyzer being modified in time relative to one another;

an evaluation device evaluating intensity changes in the reflected beam and determining the film thickness as a function of the intensity changes; and

an angle measurement device sensing an angle of the reflected beam relative to a tangential plane of that does not intersect the substrate at the incidence point, the evaluation device determining the film thickness as a function of the sensed angle, wherein:

the angle measurement device includes a photodetector unit that is position-sensitive in at least one of an X and Y direction, an angle of reflection being calculated from position data and distance data with an evaluation stage, and

the intensity changes and the position data are sensed with a same photodetector.

12. The measurement apparatus according to claim 10, wherein the photodetector unit includes two position-sensitive photodetectors arranged at a distance from the incidence point in a beam path of the reflected beam, the angle of reflecting being calculated based on differing positions of the reflected beam on the two position-sensitive photodetectors.

13. The measurement apparatus according to claim 12, further comprising:

a beam splitter arranged in the beam path of the reflected beam in front of the two position-sensitive photodetectors, each of the two position-sensitive photodetectors receiving a partial beam of the reflected beam.

14. The measurement apparatus according to claim 9, further comprising:

a converging lens arranged in front of the photodetector device.

15. The measurement apparatus according to claim 9, wherein the transmitting optical system and the receiving optical system are integrated into a common carrier, the carrier having a three-point support for placement of the film.
16. The measurement apparatus according to claim 9, wherein the transmitting optical system includes a polarizer and a  $\lambda/4$  plate in a beam path of the beam, and wherein one of the polarizer and the analyzer is arranged in rotationally driven fashion about an axis normal to a surface of the one of the polarizer and the analyzer.